

US EPA ARCHIVE DOCUMENT

# **The Determination of Oil Persistence: A Historical Perspective**

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per•sist (pr-sst, -zst)

1. To be obstinately  
repetitious, insistent, or  
tenacious
- 2 To hold firmly and  
steadfastly
3. To continue in existence; last

# The Clean Water Act, OPA Amendment

Preparedness requirement: to establish procedures, methods, and equipment to contain discharges of oil from vessels and facilities

- **EPA:** Non-transportation-related onshore facilities and some offshore facilities
- **Coast Guard:** Marine transportation-related facilities, deep water ports, and vessels

**U.S. EPA:**

Facility Response Plan Rule

(40 CFR 112.20 and 112.21)



## U.S. Coast Guard:

Response Plans for Marine Transportation-  
Related Facilities (33 CFR 154)

Oil or Hazardous Material Pollution  
Prevention Regulations for Vessels (33 CFR  
155)



# Non-Persistent Oil

## EPA and U.S. Coast Guard Definition

A petroleum based oil that consists of hydrocarbon fractions:

- At least 50% of which by volume, distill at a temperature of 340°C (645°F); and
- At least 95% of which by volume, distill at a temperature of 370°C (700°F).

*Also known as Group 1 Oils*

# Persistent Oil

## EPA and U.S. Coast Guard Definition

**A petroleum-based oil that does not meet the distillation criteria for non-persistent oils.**

**Persistent oils are further classified based on specific gravity as follows:**

- Group 2 - specific gravity less than 0.85;
- Group 3 - specific gravity equal to or greater than 0.85 and less than 0.95;
- Group 4 - specific gravity equal to or greater than 0.95 and less than 1.0; or
- Group 5 - specific gravity equal to or greater than 1.0.



# Significance in EPA and Coast Guard FRP Regulatory Requirements

- **Calculating Planning Distances**
  - Persistent oils: 15 miles from the facility
  - Non-persistent oils: 5 miles from the facility
- **Response Plan Development Criteria**
  - Response time and minimum quantity of boom required depend on oil persistency group
- **Determination of On-Water Recovery and Shoreline Cleanup Capacity and Worst Case Planning Volumes**
  - Removal capacity planning and shoreline cleanup volume
  - Adjusted according to emulsification factors

## Limitations to Defining Specific Oils According to Persistence Type

- Different batches of a particular oil type can have different characteristics
- Weathering (persistence can vary at different times throughout spill recovery)
- Environmental conditions (water salinity, microorganisms, air and water temperatures affect persistence)

# National Oceanic and Atmospheric Administration (NOAA)

- **Type 1: Very Light Oils**
  - Jet Fuels, Gasoline
- **Type 2: Light Oils**
  - Diesel, No. 2 Fuel Oil, Light Crudes
- **Type 3: Medium Oils**
  - Most Crude Oils
- **Type 4: Heavy Oils**
  - Heavy Crude Oils, No. 6 Fuel Oil, Bunker C

# National Research Council for the National Academy of Sciences

## Petroleum Persistence for Oil Spills

| Oil Type          | Persistence |
|-------------------|-------------|
| Gasoline          | days        |
| Light Distillates | days        |
| Crudes            | months      |
| Heavy Distillates | years       |

# Washington Dept. of Ecology

## Oil Spill Damage Compensation Schedule

### Relative Ranking Scores for Classified Oils

| Oil Class              | Acute Toxicity | Mechanical Injury | Persistence |
|------------------------|----------------|-------------------|-------------|
| Prudhoe Bay Crude Oil  | 0.9            | 3.6               | 5           |
| Bunker C               | 2.3            | 5                 | 5           |
| No. 2 Fuel Oil         | 2.3            | 3.2               | 2           |
| Gasoline               | 5              | 1                 | 1           |
| Kerosene               | 1.4            | 2.4               | 1           |
| Kerosene-type Jet Fuel | 1.4            | 2.4               | 1           |

Ranks are based on scale of 0 to 5, where 0 represents the least harmful effect and 5 represents the most harmful effect.

# Environment Canada

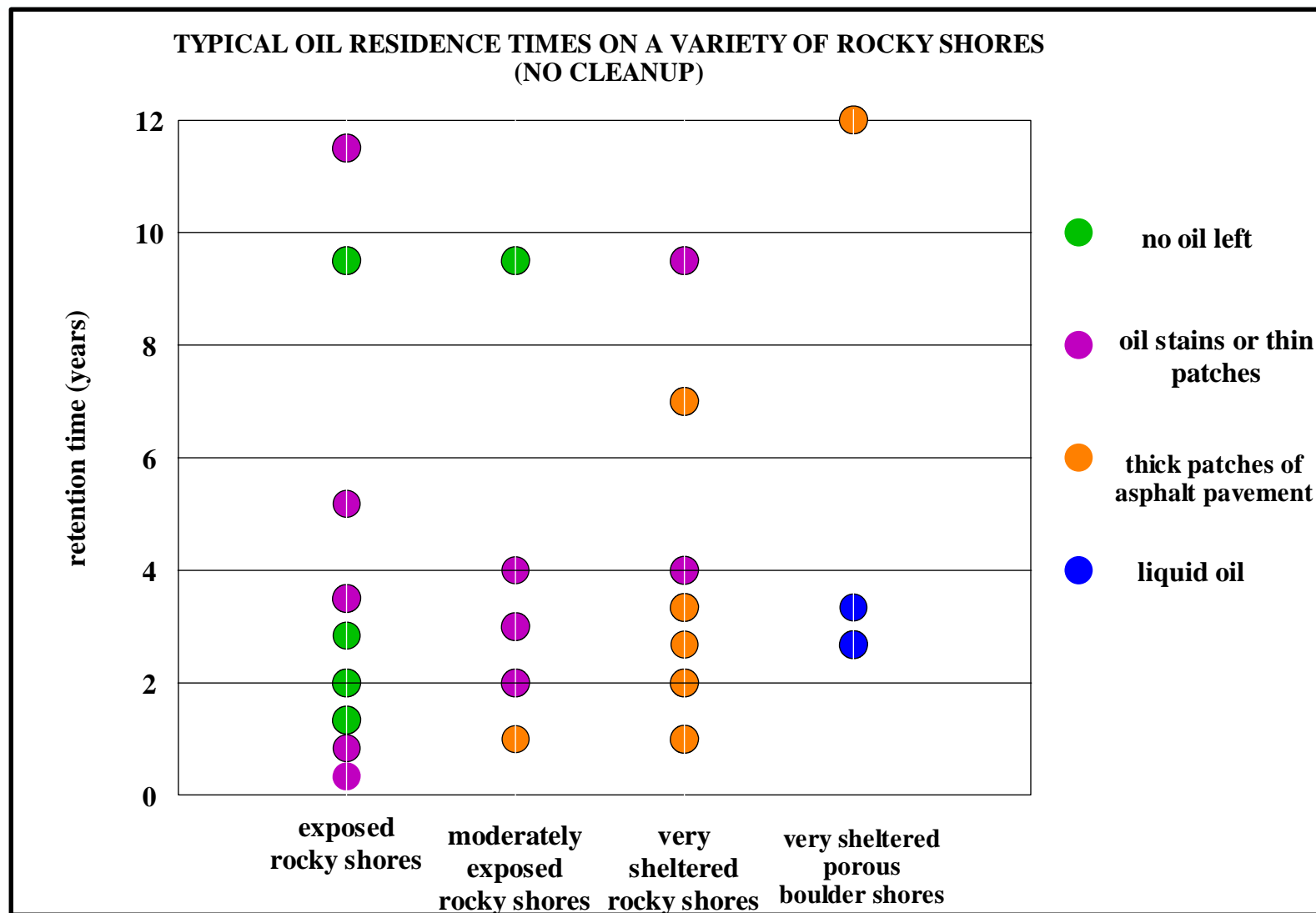
## Oil Properties

- Viscosity
- Density
- Flash Point
- Solubility in Water
- Pour Point
- API Gravity
- Interfacial Tension
- Distillation Fraction

## Oil Types

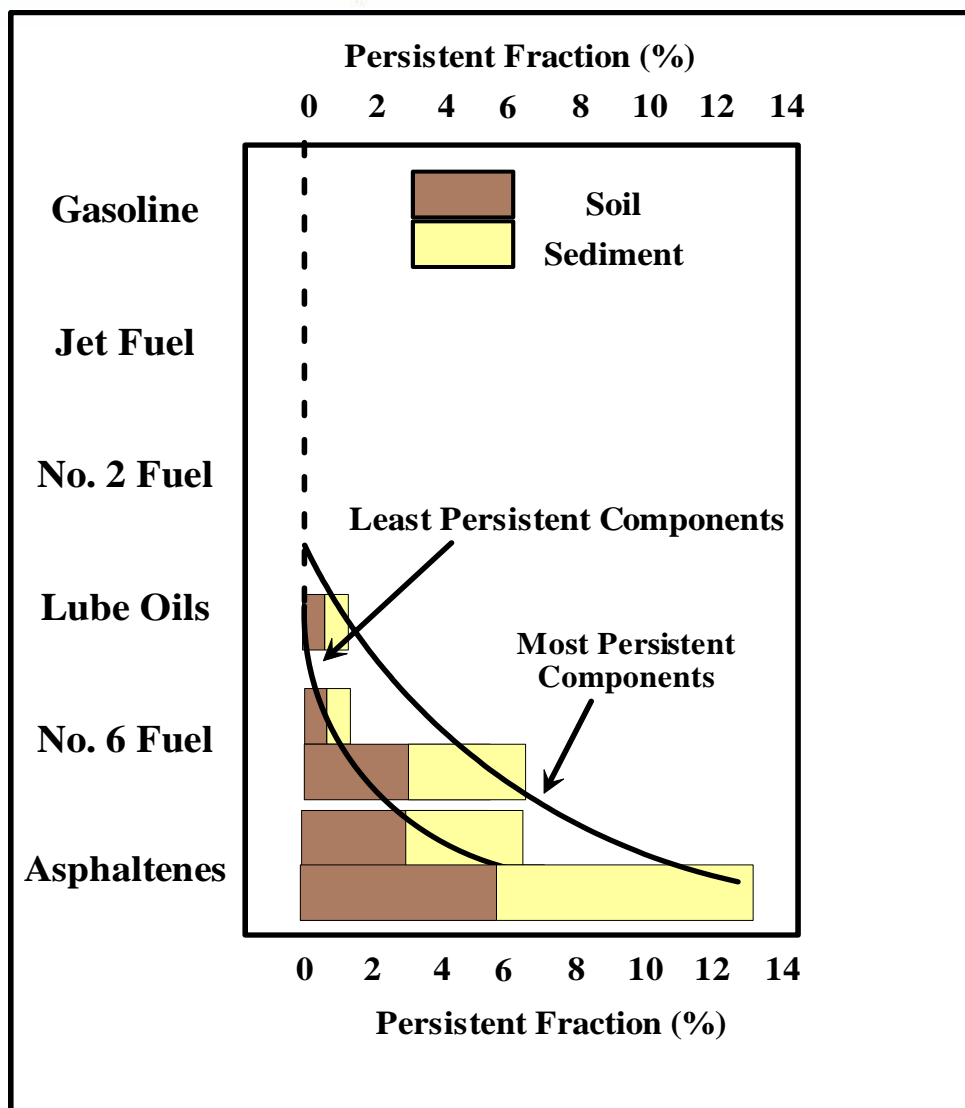
- Gasoline
- Diesel
- Light Crude
- Heavy Crude
- Intermediate Fuel Oil
- Bunker C
- Crude Oil Emulsion

# International Petroleum Industry Environmental Conservation Association



# American Petroleum Institute

## Persistent Fraction of Petroleum Products in Aquatic Environments





# American Petroleum Institute

## Numerical Scale for Relative Persistence of Oil and Oil Products in the Aquatic Environment

| Oil/Oil Product      | Relative Persistence Ranking <sup>1</sup> | Persistence Classification |
|----------------------|---|----------------------------|
| Gasoline             | 1   | “relatively nonpersistent” |
| Jet Fuel             | 2   |                            |
| No. 2 Fuel Oil       | 8   |                            |
| Lube Oils            | 55  | “slightly persistent”      |
| Light Crude Oil      | 320                                       | “highly persistent”        |
| No. 6 Fuel Oil       | 400                                       |                            |
| Medium Crude Oil     | 450                                       |                            |
| Heavy Crude Oil      | 590                                       |                            |
| Residual Asphaltenes | 1,600                                     |                            |

Relative ranking with “1” being least persistent to “1,600” being extremely persistent.

# International Maritime Organization (IMO)

## IMO Definition

- **Non-persistent oil**
  - Same as EPA/Coast Guard Definition
  - Adds: "...when tested by the American Society for Testing and Materials Method D 86/78 or any subsequent revision thereof."
- **Persistent oil.**
  - All oils which are not within the category of "non-persistent oil" as defined shall be regarded as "persistent oil."

## Summary and Conclusions

- Consistent definitions among three major organizations
- Limitations to labeling oils by persistence types
- Other approaches for addressing persistence
- Q & A